

Morigaon College (Autonomous)

Morigaon: Assam



SYLLABUS

Zoology

(3rd Semester)

Major 4
Paper: Principles of Ecology & Wildlife Management
Course Code: ZLG-CORE-(MJ/MN)-MC-0300104
Credit: 3(T)+1(P)

Course Objective:

This course aims to provide students with a comprehensive understanding of ecological principles, covering ecosystem structure, function, population ecology, community dynamics, and ecological succession. It enables learners to study interactions among organisms, population attributes, growth patterns, and regulatory mechanisms. The course further introduces the fundamentals of wildlife ecology, wildlife protection laws, protected area networks, and conservation strategies in India. Students will gain knowledge of habitat management, population survey techniques, and the use of GIS and remote sensing in wildlife studies. Practical components develop skills in field data collection, biodiversity assessment, ecological measurements, and scientific report preparation.

Learning outcomes:

1. Explain ecological concepts, ecosystem structure and function, population attributes, and community characteristics.
2. Analyse population growth forms, regulatory factors, interactions, and ecological succession patterns.
3. Describe wildlife values, causes of depletion, protection laws, protected area categories, and conservation strategies.
4. Apply field and laboratory techniques to measure ecological parameters, assess biodiversity, and study ecosystems.
5. Use wildlife survey tools, GIS/remote sensing concepts, and prepare scientific reports based on field observations.

THEORY

Hours

Ecology

Unit 1: Introduction to Ecology

5

Basic concept of Ecology and Ecosystem, Autecology, Synecology, Level of organization, Laws of limiting factors, Structural components of Ecosystem

Unit 2: Ecosystem

7

Functional attributes of Ecosystem-Trophic structure, food chain, food web, Energy flow, Ecological Pyramids, Ecological Efficiencies; Types of Ecosystems with examples.

Unit 3: Population ecology**10**

Definition, Unitary and Modular populations, Population attributes- Abundance, Density, Natality and Mortality, Life table and survivorship curve, Dispersion, Dispersal, Age distribution, Sex ratio, Biotic potential and Environmental resistance, Population growth form-Exponential and Logistic; Population regulation-density dependent and independent factors, Population interactions, Gauss's principle.

Unit 4: Biotic Community**6**

Definition of Community, Community Characteristics, Community Structure, Ecological succession and types, climax community, Ecotone and Edge effect. Terrestrial and Aquatic biotic community.

Wildlife Management**Unit 1: Introduction to Wildlife****4**

Values and importance of wildlife; Causes of depletion of wildlife in India; wildlife population survey.

Unit 2: Wildlife Ecology and Management**6**

Wildlife habitat ecology and its management, Wildlife Protection Act 1972, IUCN red list categories, Restoration of degraded habitats, Concepts of GIS and Remote sensing and their utility in wildlife habitat management.

Unit 3: Wildlife Protected Areas**7**

Concepts of protected areas, wildlife protected areas in India; Protected area network, National Parks, Sanctuaries, Man and Biosphere Reserve, Ecological sensitive zones, Conservation reserves, Community reserves, Sacred Groves.

Concepts of elephant and tiger reserves, Ramsar sites; Recent challenges of the management of Tiger reserves and Ramsar sites. Concepts and management of renewable natural resources and wildlife's welfare factors.

PRACTICAL**Hours (30)**

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1. Study of life tables and plotting of survivorship curves of different types from the hypothetical/real data provided
 2. Determination of population density by quadrat method and calculation of Shannon-Weiner diversity index in a natural/hypothetical community.
 3. Study of an aquatic ecosystem: phytoplankton and zooplankton, measurement of temperature, turbidity/penetration of light,

determination of pH, and dissolved oxygen content (Winkler's method), free CO₂.

4. Demonstration of basic equipments needed in wildlife studies (Compass, Binoculars, Range finder, Global positioning system)
5. Demonstration of different field study techniques for flora and fauna survey
6. Preparation and submission of scientific report on a visit to National Park/ Biodiversity/Wildlife sanctuary/any other important ecosystems.

Suggested Readings:

1. Raj, M (2022). Principles of Ecology. Kalyani Publishers
2. Sharma, P.D. (2016) Ecology and Environment (13th Edition). Rastogi Publications
3. Mathur, M. (2019). Wildlife Conservation and Management. Rastogi Publications.
4. Colvin, P.A. (1973). Ecology. 2nd Edition. John Wiley and Sons Inc.
5. Krebs, C. J. (2001). Ecology. 6th Edition. Benjamin Cummings.
6. Odum, E.P. (2008). Fundamentals of Ecology. Indian Edition. Brooks/Cole
7. Smith, R. L., Smith, T.M. (2000). Ecology and field biology Harper and Row publisher
8. Ricklefs, R.E. (2000). Ecology. 5th Edition. Chiron Press
9. Hall B.K. & Hallgrímsson B. (2013). Strickberger's Evolution. 5th Edition, Jones and Bartlett Publishers, Inc.
10. Futuyama, D. J. (2017). Evolution. 4th Edition, Sinauer Associates
11. Ridley, M. (2020). Evolution. 2nd edition (South Asia Edition), Oxford University Press.
12. Berwick S. H. and Saharia, V. B. (1995). Development of International principles of Wildlife Research and Management (Asian and American approaches). Oxford University Press, Delhi, Bombay, Madras. 1-481. pp.
13. Vivek Menon, (2014). Indian mammals, A Field Guide. Hachetta Book Publishing India Pvt. Ltd. 4th and 5th Floor Corporate centre, Plot No. 94, Sector 44, Gurgaon, 122001, India.
14. Hunter M. L., Gibbs, J. B. and Sterling, E. J. (2008). Problem-Solving Conservation Biology and Wildlife Management: Exercise for class, Field and laboratory, Blackwell Publishing.
15. Southerland, W. J. (2000). The conservation handbook: Research management and Policy. Blackwell Sciences.

Semester 3

Major 3

Paper: Animal Taxonomy, Systematics & Biostatistics

Course Code: ZLG-CORE-(MJ)-MC-0300204

Credit: 3(T)+1(P)

Course Objective:

This course aims to provide students with a foundational understanding of animal systematics and biostatistics. It introduces key taxonomic principles, species concepts, nomenclature rules, and modern trends in taxonomy, enabling students to identify and classify organisms scientifically. The course also builds knowledge of phylogenetic relationships and the interpretation of evolutionary patterns. In biostatistics, students learn to collect, organize, and analyse biological data using measures of central tendency, dispersion, and hypothesis-testing tools. Overall, the course equips learners with essential taxonomic skills, analytical abilities, and scientific reporting competencies necessary for biodiversity studies and biological research.

Learning outcomes:

1. Identify and classify animal taxa using taxonomic keys, species concepts, and the principles of zoological nomenclature.
2. Explain phylogenetic relationships by interpreting characters, clades, and phylogenetic trees to understand evolutionary patterns.
3. Apply statistical tools such as measures of central tendency, dispersion, t-test, ANOVA, chi-square, correlation, and regression to analyse biological data.
4. Prepare, preserve, and analyse biological specimens through practical skills in morphometry, meristics, slide preparation, and mounting techniques.
5. Collect, organize, and present scientific data using appropriate graphical methods and produce scientific reports based on field visits and observations.

THEORY

Hours

Animal Systematics

Unit 1: Introduction to Systematics:

8

Taxonomy vs Systematics; Taxon and Phenon; Contribution of Systematics to biology; Systematics as a profession, Taxonomic categories;

Concepts of species : typological, nominalistic, biological and evolutionary,

Unit 2: Taxonomic Procedure, keys & characters:

8

Taxonomic collection, preservation, method of identification, various types of taxonomic keys; dichotomous nature of keys; Taxonomic characters: morphological, behavioural, ecological, and geographical

Unit 3: Trends in taxonomy:

2

Chemotaxonomy, cytotaxonomy and molecular taxonomy (Molecular markers, microsatellites, enzymes used in molecular taxonomy)

Unit 4: Zoological Nomenclature:

6

ICZN, Principles, functions, and importance of The Code of nomenclature; principle of priority, homonymy and synonymy, principle of typification and use of types for specimens

Unit 5: Basics of phylogeny:

6

Characters (ancestral vs. derived), homology and analogy, parallelism and convergence, monophyly, polyphyly, paraphyly; representing phylogenies – Rooted and unrooted phylogenetic trees; clades; Cladograms and Phenograms

Biostatistics

Unit 1: Introduction to Biostatistics

4

Concept, Importance and Application of Biostatistics, Collection and Classification of Statistical data, Frequency distribution, Types of presentation of Statistical data

Unit 2: Measures of Central tendency

3

Mathematical average, Average of position, Measures of Partition values

Unit 3: Measures of Dispersion

4

Range, Quartile deviation, Mean deviation, Standard deviation, Co-efficient of Variation, Standard errors

Unit 4: Testing of Hypothesis

4

Confidence Intervals; Chi-square test, student's t-test, Analysis of variance, Correlation and Regression.

PRACTICAL

Hours (30)

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1. To identify and distinguish species of insects/ fishes/ amphibians/ reptiles/ birds of NE India using appropriate taxonomic keys.
 2. Morphometry and meristic study of insect and fish.
 3. Preparation of permanent slide of Euglena, Hydra, Obelia, Zoea & Nauplius.
 4. Mounting of salivary apparatus of cockroach, cycloid & ctenoid scale of fishes
 5. Graphical representation of statistical data with the help of computer (e.g., MS-Excel).
 6. Calculation of two-sample t-test for a given set of data.
 7. Calculation of F value (ANOVA) for a given set of data.
 8. Field visit to any Natural History Museum/ Zoo and scientific report preparation and submission.
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Suggested Readings:

1. Sarma, R & Raj, M (2016) A Textbook of Biostatistics. Assam book Depot
2. Haloi, A.K & Kalita, E (2013) Fundamentals of Biostatistics. 1st Edition, Kalyani publishers
3. Kapoor, V.C. (2019). Theory and Practice of Animal Taxonomy, 8th Edition, Oxford & IBH Publishing.
4. Simpson, G.G. (2012). Principles of Animal Taxonomy, Scientific Publishers (Indian Edition)
5. Mayr, E. (2022). Principles of Systematic Zoology, United Book Prints (Indian Edition)
6. Wiley, E. O. & Lieberman, B. S. (2011). Phylogenetics: Theory and Practice of Phylogenetic Systematics, Wiley Blackwell
7. Zar, J. H. (1999). Biostatistical Analysis, IV Edition, Pearson Education Inc and Dorling Kindersley Publishing Inc. USA.
8. Antonisamy, B., Christopher S. & Samuel, P. P. (2010). Biostatistics: Principles and Practice. Tata McGraw Hill Education Private Limited, India.
Pagana, M. & Gavreau, K. (2000). Principles of Biostatistics, Duxberry Press, USA

Skill Enhancement Course
Course name: Aquaculture
Credit: 2(T) + 1(P)
UG 3rd semester (Major)
Course Code: SEC-ZLG-MC-0300103

Course Objectives:

Aquaculture is the practice of growing fish and other aquatic animals for food and livelihood. It helps in increasing fish production and provides job opportunities. This course aims to give students basic knowledge about common fish species, simple aquaculture methods, pond management, feeding, and fish health. It also introduces the scope of small-scale aquaculture entrepreneurship.

Course Learning Outcomes:

- Understand basic characteristics and life cycle of commonly cultured fish.
- Learn simple techniques of preparing ponds, stocking fish, and feeding.
- Identify common fish diseases and basic preventive measures.
- Know the importance and economic value of aquaculture.
- Gain confidence for starting small aquaculture units or further studies in fisheries.

THEORY — Hours: 30 (Theory Marks: 30)

Unit 1: Basics of Fish Biology and Fish Health (12 hours)

1. Introduction to aquaculture: meaning and importance.
2. Types of aquacultures: freshwater and brackish water.
3. Common cultivable fishes: Rohu, Catla, Mrigal, Tilapia, Common carp.
4. Basic structure of fish (external parts).
5. Introduction to fish diseases and easy preventive measures.

Unit 2: Aquaculture Practices and Management (10 hours)

6. Types of ponds and their use in fish farming.
7. Pond preparation: cleaning, liming, fertilizing.
8. Seed stocking: selecting healthy fish seed.
9. Transportation of fish seed / fish fry.
10. Basic feeding methods and common fish feeds.
11. Equipment used in aquaculture.
12. Easy methods of harvesting fish.

Unit 3: Aquaculture and its Economic Importance (8 hours)

15. Importance of fish farming in India.
16. Products obtained from aquaculture.
17. Idea of starting a small fish farm.
18. Aquaculture as a source of income for rural youth.

PRACTICAL — Hours: 25 (Practical Marks: 15)

1. Identification of common cultivable fish species (pictures/models).
2. Identification of basic aquaculture tools.
3. Simple observation of pond water parameters (pH, temperature).
4. Demonstration of pond preparation steps.
5. Observation of signs of common fish diseases (photos/specimens).
6. Preparation of a short report on a local fish farm or fish market.
7. Visit to a course related fishery college.

Suggested Readings:

- ✓ Handbook of Fisheries and Aquaculture — ICAR Publication
- ✓ Santhanam, R. — A Manual of Freshwater Aquaculture
- ✓ Pillay, T.V.R.& Kutty, M.N. — Aquaculture: Principle and Practices
- ✓ Jhingran, V.G. (1991). Fish and Fisheries of India
- ✓ Roberts, R.J. (2012). Fish Pathology